

**TWENTY-FIFTH JUDICIAL DISTRICT COURT
FOR THE PARISH OF PLAQUEMINES
STATE OF LOUISIANA**

HERO LANDS COMPANY, L.L.C.	*	
	*	DOCKET NO. 64-320
VERSUS	*	
	*	DIVISION "A"
CHEVRON U.S.A. INC., ET AL.	*	

SUPPLEMENTAL REPORT OF JOHN R. FRAZIER, Ph.D., CHP

I. INTRODUCTION

I have been retained by counsel for defendant Chevron U.S.A. Inc. in the matter of Hero Lands Company, L.L.C. versus Chevron U.S.A. Inc., et al. (25th Judicial District Court for the Parish of Plaquemines, State of Louisiana [Docket No. 64-320; Division "A"]), to assess the radiological conditions of a specific parcel of land in the Stella Oil and Gas Field in Plaquemines Parish, Louisiana. Specifically, I have been asked to determine whether there is naturally occurring radioactive material (NORM) due to oil and gas operations of the property. I have also been asked to review the reports by Plaintiff's experts Gregory W. Miller, Jason S. Sills, Charles R. Norman, William J. Rogers, Paul H. Templet, and Walker B. Wilson in this matter and provide opinions with respect to those reports. I submitted my expert report in this matter on May 8, 2020. I visited the subject property on August 20, 2020. Also following submission of my May 8, 2020 report, I received additional laboratory reports of analysis for eleven (11) samples of groundwater and 11 split groundwater samples from the subject property. I am submitting this report to include the additional groundwater data and to update my May 8, 2020 report.

II. OPINIONS

I have reached the following conclusions with a reasonable degree of scientific certainty:

1. My opinions given in my May 8, 2020 report in this case are unchanged.
2. Laboratory reports of analyses received since May 8, 2020 include NORM measurement results for 11 groundwater samples and 11 split groundwater

samples from the subject property that show no additional locations that have NORM concentrations that are consistent with the presence of oilfield NORM in old produced water from oil production activities, other than the approximately six wells discussed in my May 8, 2020 report.

III. QUALIFICATIONS

My qualifications are detailed in Attachment A of my May 8, 2020 report in this case and are unchanged since that report.

IV. BASIS OF OPINIONS

During preparation of my opinions presented in this report I reviewed documents related to the subject property and natural radiological conditions in the vicinity of the subject property and throughout the State of Louisiana. Specific documents that I reviewed in preparation of this report are listed in Attachment A. This list of documents replaces the list in Attachment B of my May 8, 2020 report.

My discussion basic concepts of NORM and natural background radiation and radioactive materials in Louisiana given in Section IV-A through D of my May 8, 2020 report are unchanged.

A. Description of the Subject Property

The property that is the subject of my radiological assessment is a parcel of land located in the Stella Oil and Gas Field in Plaquemines Parish, Louisiana. Descriptions of the location and history of oil production operations on the subject property are given in reports listed in Attachment A.

B. Collection and Analysis of Additional Groundwater Samples

In my May 8, 2020 report, I described the collection, analysis and measurement results of forty-two (42) groundwater samples that were collected from wells on the subject property by ICON personnel on behalf of Plaintiff from August 28, 2018 to April 9, 2019 (Miller 2019). Following submission of my May 8, 2020 report, I received reports of laboratory analysis of eleven (11) additional samples of groundwater collected from the subject property during January 21-24, 2020 and July 15-16, 2020, by ICON (Pace 2020a; Pace 2020b). I also received reports of laboratory analysis of 11 split samples of groundwater collected from the subject property during January 21-24, 2020 and July 15-16, 2020, by ERM Environmental Resources Management, in Metairie, Louisiana (ERM) (Eberline 2020a; Eberline 2020b). As with the groundwater samples described in my May 8, 2020 report, each sample was sealed in a sample

container, marked with a unique identification code, and shipped under chain of custody to the respective laboratories for analysis (Pace laboratory for ICON’s samples and Eberline laboratory for ERM’s samples). Both laboratories measured the concentrations of Ra-226 and Ra-228 in each of the 11 samples they received. Eberline also measured the total dissolved solids (TDS) in each of the 11 samples they received. Results of Eberline’s laboratory analysis of the 11 samples (and two laboratory duplicate samples) were reported in two reports of analysis (Eberline 2020a; Eberline 2020b). The two laboratory reports of analysis by Eberline are included as Attachments B1 and B2. The results of the measurements by Eberline are summarized in Table 1.

Table 1. Summary of Results of Laboratory Analysis of Split Samples Collected by ERM on January 21-24, 2020 and July 15-16, 2020

Sample ID	Ra-226				Ra-228				TDS (mg/L)
	Result (pCi/g)	CU (pCi/g)	CSU (pCi/g)	MDC (pCi/g)	Result (pCi/g)	CU (pCi/g)	CSU (pCi/g)	MDC (pCi/g)	
MW 1A LAB DUP	2.00	0.60	0.74	0.37	1.34	0.46	0.55	0.83	9,073
MW 8B	0.37	0.31	0.32	0.42	0.78	0.43	0.47	0.84	11,965
MW 1A	1.38	0.50	0.58	0.36	0.75	0.35	0.39	0.65	9,073
MW 1B	17.53	3.50	5.10	1.70	10.38	0.75	2.46	0.85	66,403
MW 6A	0.97	0.46	0.51	0.39	1.30	0.48	0.56	0.88	5,518
MW 5A	7.27	1.26	1.99	0.26	4.69	0.64	1.24	0.95	24,181
MW-2B LAB DUP	0.03	0.19	0.19	0.40	0.50	0.44	0.46	0.89	2,550
MW-3A	147.*	14.8	34.5	2.88	27.0	2.09	6.47	2.38	31,400
MW-4A	1.60	0.43	0.55	0.26	1.87	0.51	0.67	0.90	10,200
MW-9B	0.05	0.14	0.14	0.29	1.13	0.52	0.58	1.00	2,410
MW-7A	0.27	0.27	0.27	0.37	1.51	0.54	0.64	0.96	3,020
MW-2A	0.86	0.36	0.41	0.30	1.12	0.43	0.50	0.79	7,320
MW-2B	0.27	0.23	0.24	0.28	0.34	0.56	0.57	1.17	2,550

where “CU” = Counting Uncertainty, “CSU” = Combined Standard Uncertainty, and “MDC” = Minimum Detectable Concentration.

* Laboratory results for Ra-226 in sample MW-3A show significant interference for the measurement method (EPA Method 903.1). The reported result is an outlier and not confirmed by Pace analysis of the split of this sample.

C. Assessment of the Analytical Results for Groundwater Samples

The measurement results for the 11 additional samples analyzed by Pace combined with the results reported by Pace for the 42 groundwater samples (discussed in my May 8, 2020 report) total 53 groundwater samples analyzed by Pace from the subject property. My evaluation of the results and their associated CSU suggest there are possibly six wells (BC-2A, BC-3A, BC-

7A, BC-8A, BC 23, and BC 26) that have concentrations of Ra-226 and Ra-228 that are consistent with aged produced water. Results for the remaining wells are consistent with only natural background concentrations of Ra-226 and Ra-228 in solids (i.e., TDS) in groundwater samples.

The measurement results for the 11 additional split samples analyzed by Eberline combined with the results reported by Eberline for the 42 groundwater samples (discussed in my May 8, 2020 report) total 53 groundwater samples analyzed by Eberline from the subject property. My evaluation of the results and their associated CSU suggest there are possibly six wells (BC-2A, BC 10, BC 13, BC 16, BC 23, and BC 26) that have concentrations of Ra-226 and Ra-228 that are consistent with aged produced water. Results for the remaining wells are consistent with only natural background concentrations of Ra-226 and Ra-228 in TDS in groundwater samples.

These conclusions follow from observation that the natural concentration of Ra-226 is approximately equal to the natural concentration of Ra-228 in groundwater samples (taking into account the overall uncertainty of the laboratory measurements) having the respective TDS concentrations (IAEA 1990; IAEA 2014; USGS 1988; Kraemer 1984).

The national secondary standard for TDS in drinking water is 500 milligrams per liter (mg/L). Samples of groundwater from the subject property exhibit a wide range of TDS concentrations and all the samples have TDS concentrations greater than 500 mg/L. The lowest concentration of TDS in the 53 samples analyzed by Eberline was nearly twice the secondary standard of 500 mg/L. The measured TDS concentrations in the groundwater samples from the subject property bring into question whether the groundwater is potable (USGS 2020; LDNR 2020).

The observations, conclusions, and opinions noted in this report are based on my personal knowledge and experience and are consistent with accepted practice in the field of health physics. I reserve the right to amend this report should additional data or other information become available to me in the future.

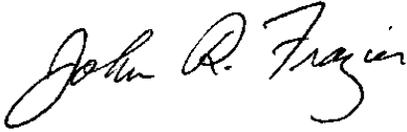
V. RATE OF COMPENSATION

I am being compensated at a rate of \$250 per hour for my time to work on this project, including sworn testimony at deposition and trial.

VI. PRIOR TESTIMONY

A list of cases in which I have given sworn testimony at deposition or at trial since submission of my May 8, 2020 report is included in Attachment C.

Prepared and submitted by:

A handwritten signature in black ink that reads "John R. Frazier". The signature is written in a cursive style with a large, prominent "J" and "F".

John R. Frazier, Ph.D., CHP

Date: September 5, 2020

ATTACHMENT A
LIST OF DOCUMENTS REVIEWED

ATTACHMENT A

Beck 1986 Beck, J.N., et al., “Environmental Radiation Exposure Rate in Louisiana,” Journal of Environmental Quality, Vol. 15, 1986.

DeLaune 1986 Delaune, R.D., et al., “Radionuclide Concentrations in Louisiana Soils and Sediments”, Health Physics, Vol. 51, August 1986.

Eberline 2018 Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 18-09025-OR, Oak Ridge, Tennessee, October 10, 2018.

Eberline 2019a Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 19-02131-OR, Oak Ridge, Tennessee, April 25, 2019.

Eberline 2019b Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 19-04089-OR, Oak Ridge, Tennessee, June 3, 2019.

Eberline 2019c Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 19-04087-OR, Oak Ridge, Tennessee, July 2, 2019.

Eberline 2019d Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 19-05060-OR, Oak Ridge, Tennessee, September 3, 2019.

Eberline 2020a Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 20-01124-OR, Oak Ridge, Tennessee, April 3, 2020.

Eberline 2020b Eberline Analytical Corporation, “Final Report of Analysis,” Work Order No. 20-07104-OR, Oak Ridge, Tennessee, August 12, 2020.

IAEA 1990 International Atomic Energy Agency (IAEA), “The Environmental Behaviour of Radium, Volumes 1 & 2,” Technical Reports Series No. 310, Vienna, Austria, 1990.

IAEA 2003 International Atomic Energy Agency (IAEA), “Extent of Environmental Contamination by Naturally Occurring Radioactive Material (NORM) and Technological Options for Mitigation,” Technical Reports Series No. 419, Vienna, Austria, 2003.

IAEA 2014 International Atomic Energy Agency (IAEA), “The Environmental Behaviour of Radium: Revised Edition,” Technical Reports Series No. 476, Vienna, Austria, 2014.

Kocher 1981 Kocher, David C., “Radioactive Decay Data Tables,” DOE/TIC-11026, U.S. Department of Energy, Washington, DC, 1981.

Kraemer 1984 Kraemer, Thomas F., and David F. Reid, “The Occurrence and Behavior of Radium in Saline Formation Water of the U.S. Gulf Coast Region,” Isotope Geoscience, Vol. 2, pp. 153-174, Elsevier Science Publishers, Netherlands, 1984.

LADEQ 2015 State of Louisiana Department of Environmental Quality, LAC Title 33, Environmental Quality, Part XV. Radiation Protection, Chapter 14. Regulations and Licensing of Naturally Occurring Radioactive Material (NORM), July 2015.

LDNR 2020 State of Louisiana Department of Natural Resources, “Ground Water Resources Program Glossary of Terms,” accessed 2020.
(<http://www.dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=477>)

Meriwether 1988 Meriwether, J.R., et al., “Radionuclides in Louisiana Soils”, Journal of Environmental Quality, Vol. 17, 1988.

Meriwether 1991 Meriwether, J.R., et al., “Distribution, Transport and Deposition of Radionuclides in Louisiana Soils, Final Report, LEQSF(1987-1990)-RD-A-27”, December 1991.

Meriwether 1992 Meriwether, J.R., et al., “Distribution, Transport, and Deposition of Radionuclides in Louisiana Soils, Soil Survey Data Tables”, March 1992.

Miller 2019 Miller, Gregory W., and Jason S. Sills, “Expert Report and Restoration Plan for the Landowners Hero Lands Company LLC v Chevron USA Inc., et al; Docket #64320Div “A”; 25th JDC Stella Oil Field, Plaquemines Parish, LA,” ICON Environmental Services, Inc., Port Allen, Louisiana, July 12, 2019.

Myrick 1981 Myrick, T.E., et al., “State Background Radiation Levels: Results of Measurements Taken During 1975-1979,” ORNL/TM-7343, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 1981.

NCRP 1984 National Council on Radiation Protection and Measurements (NCRP), Report No. 77, “Exposures from the Uranium Series with Emphasis on Radon and Its Daughters,” Bethesda, Maryland, March 15, 1984.

NCRP 2009 National Council on Radiation Protection and Measurements, NCRP Report No. 160, "Ionizing Radiation Exposure of the Population of the United States," Bethesda, Maryland, March 3, 2009.

Norman 2019 Norman, Charles R., “Engineering and Operations Report on Stella Oil Field (Properties of Hero Lands Company LLC), Operated by Chevron USA Inc., et al; Assessment Report in the Case of Hero Lands Company LLC Vs. Chevron USA Inc., et al; 25th Judicial District Court for the Parish of Plaquemines, State of Louisiana, Docket No. 64320, Division A; Report No. 1,” Plaquemines, Louisiana, August 12, 2019.

NRC 1999 National Research Council (NRC), “Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials,” National Academy Press, Washington, DC, 1999.

Pace 2018 Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30264148,” Greensburg, Pennsylvania, September 20, 2018.

Pace 2019a Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30282089,” Greensburg, Pennsylvania, March 18, 2019.

Pace 2019b Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30289801,” Greensburg, Pennsylvania, May 2, 2019.

Pace 2019c Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30294260,” Greensburg, Pennsylvania, June 14, 2019.

Pace 2020a Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30347374,” Greensburg, Pennsylvania, February 26, 2020.

Pace 2020b Pace Analytical Services, LLC, “Project: Hero Lands, Pace Project No.: 30374504,” Greensburg, Pennsylvania, August 13, 2020.

Rogers 2019 Rogers, William J., “Toxicological Evaluation and Risk Assessment Associated with Oil and Gas Operations on Hero Lands Company, L.L.C. Property within Stella Oil and Gas Field, Plaquemines Parish, Louisiana,” Omega EnviroSolutions, Inc., Canyon, Texas, August 26, 2019.

Smith 1996 Smith, K.P., et al., “Radiological Dose Assessment Related to Management of Naturally Occurring Radioactive Materials Generated by the Petroleum Industry,” ANL/EAD-2, Environmental Assessment Division, Argonne National Laboratory, Argonne, Illinois, September 1996

Snavely 1989 Snavely, Earl S., Jr., “Radionuclides in Produced Water: A Literature Review,” Arlington, Texas, August 1989.

Templet 2019 Templet, Paul H., “An Expert Report by Paul H. Templet, Ph.D., Hero Lands Co. LLC v Chevron USA Inc., et al; Docket #64320, Div. A; 25th JDC; Stella Oil Field, Plaquemines Parish, LA,” Templet Resources, Inc., Ranchos de Taos, New Mexico, August 12, 2019.

US EPA 2000a “Radionuclides Notice of Data Availability Technical Support Document”, US EPA Office of Ground Water and Drinking Water and Office of Indoor Air and Radiation, Washington, DC, March 2000.

US EPA 2000b National Primary Drinking Water Regulations; Radionuclides; Final Rule, 40 CFR Parts 9, 141, and 142, Federal Register 65 FR 76707, Vol. 65, No. 236, Washington, DC, December 7, 2000.

US EPA 2002 “Implementation Guidance for Radionuclides,” EPA 816-F-00-002, Office of Ground Water and Drinking Water (4606M), Washington, DC, March 2002.

USGS 1988 U.S. Geological Survey (USGS), “Radiochemical Analyses of Ground Water in Louisiana – Water Resources Technical Report No. 44,” by John L Snider and Fary N. Ryals

(USGS), Published by Louisiana Department of Transportation and Development, Baton Rouge, Louisiana, 1988.

USGS 2012 U.S. Geological Survey (USGS), “Principal Aquifers Can Contribute Radium to Sources of Drinking Water Under Certain Geochemical Conditions,” Fact Sheet 2010-3113, Washington, DC, 2012.

USGS 2020 U.S. Geological Survey (USGS), “Dictionary of Terms,” Washington, DC, (https://www.usgs.gov/special-topic/water-science-school/science/dictionary-water-terms?qt-science_center_objects=0#P), accessed 2020.

Wilson 2019 Wilson, Walker B., “Ecological Impacts Associated with Oil and Gas Exploration and Production Activities on Hero Lands Company, L.L.C. Property Within Stella Oil and Gas Field, Plaquemines Parish, Louisiana,” Coastal Environments, Inc., Baton Rouge, Louisiana, August 12, 2019.

ATTACHMENT B1: EBERLINE WORK ORDER #20-01124-OR
ATTACHMENT B2: EBERLINE WORK ORDER #20-07104-OR

(in separate electronic files)

ATTACHMENT C

**LITIGATION IN WHICH DR. JOHN R. FRAZIER HAS PROVIDED
SWORN TESTIMONY SINCE MAY 8, 2020**

**LITIGATION IN WHICH DR. JOHN R. FRAZIER HAS PROVIDED SWORN
TESTIMONY SINCE MAY 8, 2020**

<u>LAW FIRM</u>	<u>CASE</u>	<u>CLIENT</u>	<u>DATE</u>
Liskow & Lewis	Jack Anthony Devillier, et al. v. Chevron U.S.A. Inc., et al.	Chevron U.S.A. Inc., et al.	July 8, 2020
Kean Miller	Hero Lands Company, L.L.C. v. Chevron U.S.A. Inc., et al.	Chevron U.S.A. Inc., et al.	July 10, 2020
Shook Hardy & Bacon	Scott D. McClurg, et al. v. Mallinckrodt LLC, et al.	Mallinckrodt LLC, et al.	August 17, 2020